

Accuracy Comparison for Large Extent Vegetation Maps of Alaska

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Background

Multiple maps have been created in recent years to represent vegetation across large extents (i.e., covering areas approximately equivalent to or larger than biomes) within Alaska. This accuracy assessment provides quantitative guidance on the use of vegetation maps. While the quantitative accuracies are a useful data-driven approach to comparing map accuracies, users should also inspect qualitative accuracy in their regions of interest prior to applying particular maps.

Methods

To produce a quantitative accuracy comparison, I split ground and aerial vegetation plot data from 2000 through 2019 used to develop the *Continuous Foliar Cover of Plant Species and Aggregates in North American Beringia v1.0*¹ (referred to as the “AKVEG Map” in Table 1) into ten cross validation partitions. I identified 15 species or species aggregates to use as accuracy indicators to enable consistent comparison between maps regardless of major differences in classification schemes, as well as to compare categorical vegetation type maps to continuous abundance maps. The indicators represent species and aggregates that are widespread and frequently dominant or otherwise important in boreal and Arctic Alaska. For each species or aggregate, I summarized the mean foliar cover per map class from nine cross validation partitions and determined how well the class mean predicted observed values in the 10th cross validation partition. I repeated the process until each cross validation partition was withheld a single time as the test data. This process simultaneously assessed both how well the training labels matched the mapped labels and how well the classification scheme represented underlying variation in vegetation composition and structure.

For categorical maps, the accuracy assessment process used linear models with one-hot-encoded covariates (map classes). Given that the continuous abundance maps lacked classes, Nawrocki et al. (2021) assessed their accuracy using a hierarchical cross-validation intrinsic to the modeling process (see Nawrocki et al. 2021¹ for detailed methods). The reported accuracy metrics for the continuous abundance maps still derived from the same ten-fold cross validation scheme that I applied to the categorical maps. Public data used in the accuracy assessment are available through the AKVEG Database (<https://akveg.uaa.alaska.edu>).

All code used for the accuracy assessment is available (<https://github.com/accs-uaa/akveg-map>) should any wish to check, replicate, or extend the assessment.

¹ Nawrocki, T.W., M.L. Carlson, A.F. Wells, M.J. Macander, E. Jamie Trammell, F.D.W. Witmer, C.A. Roland, K. Baer, and D.K. Swanson. 2021. Continuous Foliar Cover of Plant Species and Aggregates in North American Beringia. Map User Guide and Accuracy Assessment. Version 1.0 (May 2021). Available: <https://accscatalog.uaa.alaska.edu/dataset/continuous-foliar-cover-plant-species-and-aggregates-north-american-beringia>

Results

Table 1 provides an accuracy comparison of seven large extent vegetation maps for Alaska. Maps in Table 1 are labeled as follows:

1. AKVEG Map: *Continuous Foliar Cover Map of Species and Aggregates in North American Beringia*¹
2. Landfire EVT: Landfire Existing Vegetation Type 2016
3. AKVWC Fine: Alaska Vegetation and Wetland Composite Fine Classes
4. AKVWC Coarse: Alaska Vegetation and Wetland Composite Coarse Classes
5. ABoVE 2014: Arctic-boreal Vulnerability Experiment Dominant Land Cover 2014
6. NLCD 2016: National Land Cover Database 2016
7. EPSCOR Interior: UAF EPSCOR Vegetation Maps, Boreal Alaska

Table 1. Predictive R² of six large extent vegetation maps for Alaska. Map columns are organized left to right from highest to lowest overall performance.

Indicator	AKVEG Map	Landfire EVT 2016	AKVWC Fine	AKVWC Coarse	ABoVE 2014	NLCD 2016	EPSCOR Interior
<i>Alnus</i> Shrubs	0.58	0.25	0.20	0.18	0.09	0.08	0.13
<i>Betula</i> Shrubs	0.50	0.22	0.26	0.16	0.10	0.09	0.02
<i>Betula</i> Trees	0.62	0.34	0.39	0.31	0.21	0.26	0.30
Deciduous Trees	0.59	0.37	0.36	0.34	0.20	0.31	0.26
<i>Dryas</i> Shrubs	0.41	0.20	0.16	0.07	0.07	0.03	0.01
<i>Empetrum nigrum</i>	0.43	0.18	0.26	0.14	0.08	0.07	-0.02
<i>Eriophorum vaginatum</i>	0.53	0.19	0.34	0.17	0.08	0.04	0.09
<i>Picea glauca</i>	0.54	0.34	0.23	0.23	0.24	0.21	0.14
<i>Picea mariana</i>	0.50	0.38	0.23	0.21	0.25	0.17	0.11
<i>Rhododendron</i> Shrubs	0.55	0.25	0.30	0.18	0.13	0.08	0.00
<i>Salix</i> Low-tall Shrubs	0.40	0.11	0.18	0.11	0.16	0.09	0.02
<i>Sphagnum</i>	0.52	0.22	0.19	0.08	0.08	0.08	0.15
<i>Vaccinium uliginosum</i>	0.49	0.23	0.27	0.14	0.07	0.11	0.00
<i>Vaccinium vitis-idaea</i>	0.40	0.12	0.11	0.11	0.10	0.03	-0.06
Wetland Sedges	0.45	0.20	0.18	0.17	0.06	0.14	0.05
Mean	0.50	0.24	0.24	0.17	0.13	0.12	0.08